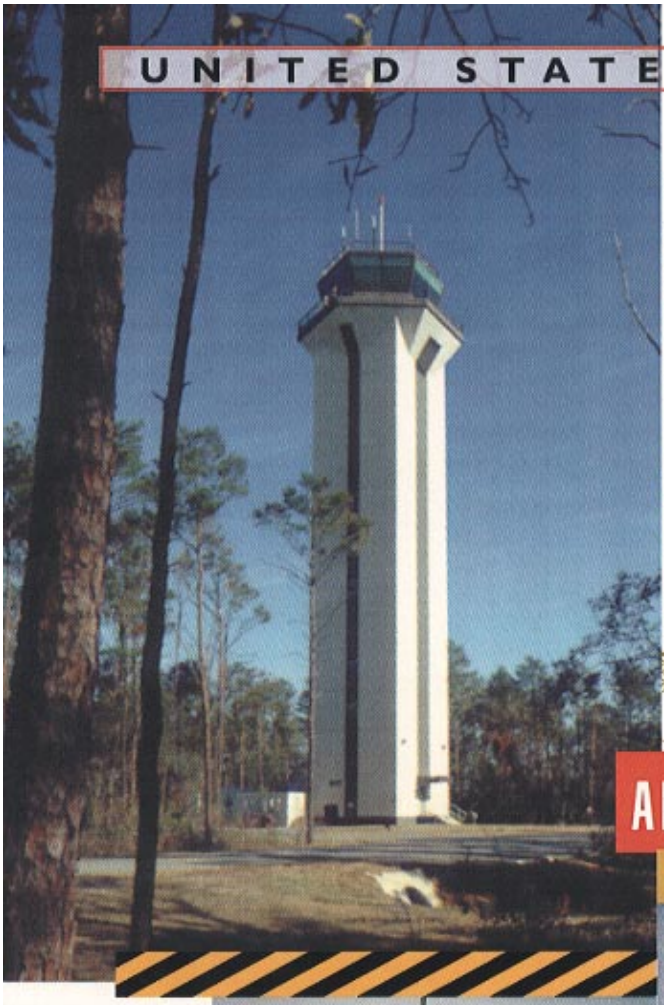
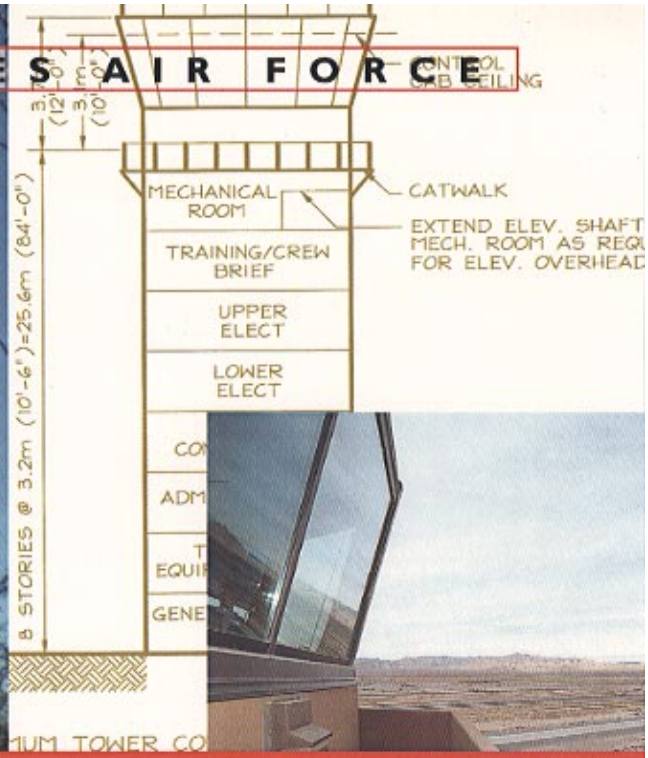
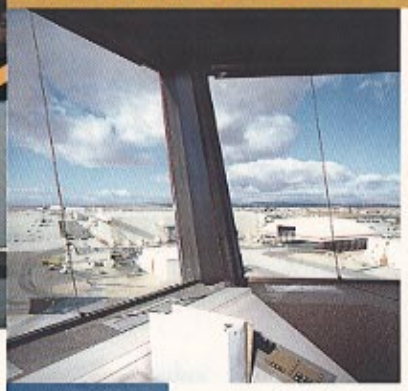
UNITED STATES AIR FORCE





AIR TRAFFIC CONTROL TOWER

DESIGN GUIDE



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THE CIVIL ENGINEER

The Air Force mission is to defend the United States through control and exploitation of air and space. To do this safely and effectively, we must be able to manage our air and space force assets in the air and on the ground. An important element in this process is control of aerial port and vicinity airspace at our bases. That function is carried out from one of the most important mission facilities at an installation - the air traffic control tower. It is the life-blood of aerial port operations, integrating high tech electronic gear and professional airport operations personnel.

Perhaps the tallest, most visible feature at most air bases, the air traffic control tower makes an undeniable aesthetic statement and can dominate the visual environment. It is our duty to not only make the tower a functional mission facility, but also a pleasing architectural statement. An architecturally compatible, highly functional facility should result when you combine the knowledge from your design team with the information in this Design Guide. Such facilities will help insure that the Air Force continues its top-notch aerial port operations and reaches its goal of building the world's most respected Air and Space force.

1.1 PURPOSE

This Design Guide provides basic guidance and criteria for programming and designing new Air Traffic Control Towers (ATCT) and renovating existing control towers. Specific items herein are minimum standards, and may be modified by particular requirements of the base or other special design parameters. For latest information and drawings, plans, utility, siting and electronic requirements, consult the Air Force Flight Standards Agency (AFFSA), Andrews AFB MD and the 38th Engineering Installation Wing (EIW), Director of Plans and Requirements, Tinker AFB OK.

1.2 SCOPE AND OBJECTIVES

The objective of this Guide is to improve the functionality and the working environment of our air traffic control towers. The ATCT is one of the most visually prominent structures on a base. The architectural statement made by the air traffic control towers greatly influences visitors' impressions of the base. There is a professional obligation to actively control functional as well as aesthetically compatible facilities as a means of achieving design excellence in the Air Force. The key step in establishing the correct architectural statement is to design the structure so that the exterior elevations achieve architectural compatibility with the base general plan. Design considerations include regional, local,

CONTROL TOWER, NELLIS AFB

CONTROL TOWER, EDWARDS AFB

physical and man-made characteristics, i.e., history, culture, climate, landscape and existing architectural style.

It is important to design for these factors while at the same time achieving uniqueness. The architectural style, scale, form and contrast should be compatible with the context of other structures adjacent to the site. These elements are necessary to provide consistency with the base architectural theme. The correct combination of materials, textures, color, type of construction, details and building systems should establish an architectural style that symbolizes a modern Air Force. The massing, shape, form and articulation should define the control tower shaft with clean, vertical lines and a smooth transition to the control tower cab. For the reasons presented here, there is no definitive architectural standard for the elevation view of control towers today. Designers should use the appropriate MAJCOM architectural and interior design standards as well as base level architectural, interior design, engineering, parking and landscaping standards.

1.3 SITE SELECTION

1.3.1. Once the need for a new ATCT is validated, a site survey must be performed. The survey will determine the tower height, location, configuration and orientation prior to, or preferably in conjunction with, the conceptual design stage. The survey is coordinated by the MAJCOM programming and requirements section. A team of architects and engineers will work closely with the MAJCOM project manager to conduct a charette to investigate the requirements and develop a Project Definition (PD). Coordination of efforts with a representative from AFFSA is required. Support for the team from the base comprehensive planner, structural and electronic engineers from the applicable engineering and installation units (E&I) and host command civil engineers, as well as C4 systems developers and the ATCT users, is essential to the charette process. The site selection is conducted in accordance with (IAW) guidelines provided in AFI 32-1026. An Environmental Impact Analysis Process (EIAP) study must also be performed in accordance with the National Environmental Policy Act (NEPA).

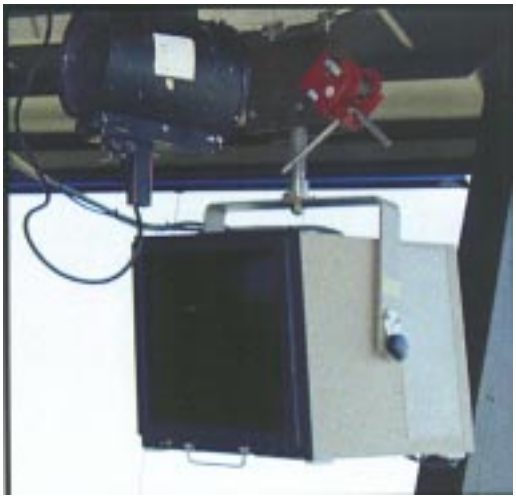
1.3.2. A product of the site survey is the Statement of Intent (SOI). The SOI describes the location, configuration, orientation, required height, and civil engineering support requirements for the new tower. Copies of the SOI are provided to the Local Airfield Operations Flight (AOF), the Civil Engineer (CE) and the Local Communications Unit

1.4
WORK NOT INCLUDED IN THE CONSTRUCTION CONTRACT

(UCCO) for coordination and signatures by the Base Commander and/or Wing Commander and other appropriate base officials.

The following items, except as noted, are government furnished equipment (GFE) and will be installed by others during construction or upon completion of the construction contract.

1.4.1. ELECTRONIC EQUIPMENT. The Airfield Lighting Panel, with connections and interface to the airfield lighting vault, will be provided and installed by the construction contractor.



1.4.2 TOWER RADAR DISPLAY MONITOR

1.4.2. TOWER RADAR DISPLAY MONITOR. Ceiling mounted track and trolley are to be included in construction contract. (See Drawing 10 for details.) Latest information will be sent upon request. (See paragraph 1.1)

1.4.3 ANTENNAS. Antennas will be mounted on antenna masts. All required safety features and lightning protection will be incorporated into the antenna masts to protect the property and personnel who work on them. USAF Engineering and Installation (E&I) unit personnel will install antennas. As well as being capable of resisting lateral loads required by the applicable safety codes, the antenna mast must withstand wind loads based on the

1.4.3 ANTENNAS

1.4.4 LIGHT GUNS

maximum gust conditions and take into consideration the projected heights of antennas to be mounted on the ATCT.

1.4.4 LIGHT GUNS. The construction contractor must make eye bolt provisions in the ceiling to hang the light guns. These should be located adjacent to light gun outlets shown in Drawing 8.

1.4.5 TV SECURITY SYSTEM. This system is government furnished and government installed (GFGI). The contractor provides rough-in and conduits with
pull wires as required.

1.5
RELIABILITY AND MAINTAINABILITY

Reliability and maintainability must be included as an integral part of design. Use ETL 88-4, Reliability and Maintainability (R&M) Design Checklist.

The recommended method to develop a conceptual design of an ATCT is through the charrette process. A charrette is an intensive one or two week on-site process where a team of architects and engineers interview the facility users, coordinate with a MAJCOM air traffic specialist, and the MAJCOM/CEP project manager to develop a Project Definition, to include a written design analysis and cost estimate. The charrette facilitates close coordination and quick decisions from all concerned parties and results in a fast track 10 percent design which better meets the needs of the user.

2.1
ARCHITECTURAL/ STRUCTURAL

2.1.1. The ATCT will generally conform with the functional layout drawings (Drawings 1 through 11) shown herein. Except as otherwise specified herein, the designer shall choose all construction materials based on lowest economic life-

2.1.2 TOWER SHAFT STRUCTURAL SYSTEM

cycle costs and shall conform to the requirements of MIL HDBK 1190 (re: MIL HDBK 1008B Fire Protection for Facilities). Design shall be based on the following minimum criteria:

2.1.2. The designer shall provide the number of floors as required to meet control tower height required, per the approved site survey. (Each floor is to be 3.2 m (10 ft 6 in) in height.)

2.1.3. Dead and live loads shall be ‘AW current American Society of Civil Engineers (ASCE) publication ASCE 7, *Minimum Design Loads for Buildings and Other Structures*, latest issue, except where supplemented by AFM 88-3, Chapter 13, *Seismic Design for Buildings*, and AFM 88-3, Chapter 13, section A, *Seismic Design Guidelines for Essential Buildings*. Wind loads shall conform to the wind load design requirements of ASCE 7 and AFM 88-3, Chapter 14.

2.1.4. Cab roof deck shall be sloped to drain away from center. Do not include gutters and downspouts. Roof design shall comply with AFM 88-3. Roof design should take into consideration the need to minimize rainwater from the roof dripping down the cab windows.

2.1.5. INTERIOR AND EXTERIOR FINISHES AND COLORS. Control cab ceiling and other paintable surfaces above the windows in the cab shall have a non-reflective finish. Window sills shall be covered with a non-reflective, sound-absorbing material. Ceiling tiles should be a dark color to lessen interior light reflections. Interior colors should be a mix of warm and cool colors relating to the functional areas. Exterior colors should be compatible with base decor.

When tone down is required, consideration should be given to use of pigmented concrete, stucco and CMU.

2.1.6 WINDOW MULLIONS

2.1.6. WINDOW MULLIONS. Design window mullions in the control tower cab to comply with wind load requirements while at the same time reducing visual obstructions to the maximum extent possible.

2.1.7. SHAFT WINDOWS. A single window shall be provided on the runway side of the tower shaft in the training/crew briefing room and in the chief controller's office. The number of windows in the rest of the tower shall be kept to a practical minimum for the sake of construction cost savings and maintenance/energy cost savings for the life of the facility.

2.1.8. TOWER RADAR DISPLAY EQUIPMENT. Design Tower Radar Display track system 'AW 38 EIG/

2.1.8 TOWER RADAR
DISPLAY EQUIPMENT

EICF Sketch SK 86-1. (See paragraph .). Tower Radar Display monitor is government furnished and installed. Monitor weight is approximately 68 kg (150 lbs). Latest information will be sent upon request.
2.1.9. ACOUSTICAL REQUIREMENTS. Acoustical materials with high sound absorbent coefficients shall be used as necessary in the construction of the walls, floors, and ceilings to reduce the noise level in the cab and the crew/briefing room. The design decibel level shall be no greater than 65 db, as specified in paragraph 5.8.3.3.2 of MIL-STD-1472D, dated 2 May 81. In general, if the facility is constructed lAW the recommendations contained in this document the above noise criteria will be met. Note that carpeting of walls for acoustical attenuation is not allowed. However, if local conditions are such that it is impractical to obtain the desired db level using conventional construction practices and materials, MAJCOM engineers have the authority to modify the above requirement. Note: Smoke and flame spread properties for carpet installed in the vertical position differ from normal tests in the horizontal position and may not meet building code requirements.

2.1.9.1. Carpet all occupied areas and others as designated with anti-static carpet. Carpet edge molding shall be provided at all carpet edges.

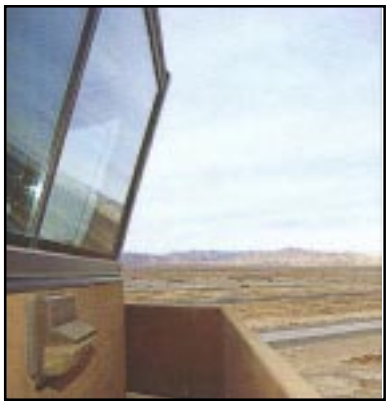
2.1.9.2. The walls below the windows and the top of the air plenum in the cab shall be covered with acoustical material.

2.1.9.3. Provide acoustical ceilings in all occupied areas. Include the electronic and mechanical equipment rooms as they tend to generate a large volume of noise pollution.

2.1.9.4. Provide vibration isolation for all noise generating equipment; e.g. air handlers.

2.1.9.5. Set back-up (Class C) generator on structurally isolated slab.

2.1.10. ROOF ACCESS. A permanent means of roof access must be provided for this facility via ladder from either the cab or the catwalk area. The ladder shall be retractable from ceiling space to the cab or catwalk floor. Locating access outside the cab is recommended to eliminate distractions from workers entering the tower cab.



2.1.11 CONTROL CAB WINDOWS

2.1.11. CONTROL CAB WINDOWS. Comply with FAA Order 6480 7c and Atch 1, and meet the following requirements for control cab windows:

2.1.11.1. MATERIALS. Windows shall be double glazed units. Glass shall conform to ASTM C 1036-85. Window units shall consist of two panes of float glass separated by a 13 mm (1/2 in) air space. The outer pane shall be Type I, Class II, Quality q^3, slightly tinted blue/green, unless glass thickness over 6 mm (1/4 in) is required, in which case, clear glass may be used. The inner pane shall be Type I, Class I, Quality q^3, clear.

2.1.11.2. GLASS THICKNESS. Each of the two panes shall be at least 6 mm (1/4 in) thick. The glass thickness may be increased to meet wind load design requirements of ANSI A58-1. (Reference AFM 88-3, Chapter 14.) Tempered glass is not authorized for use in control tower cabs. Panes of unequal thickness can be used together, e.g., 6 mm (1/4 in) tinted inside pane with a 13 mm (1/2 in) clear exterior pane.

2.1.11.3. AIR SPACE. The inner and outer panes shall be separated by a 13 mm (1/2 in) space, hermetically sealed. The entrapped air shall be dehydrated by a drying agent. Dehydration shall be guaranteed for a period of at least five years. Window units shall be fabricated for use at the elevations above mean sea level (AMSL) of the locations for which procured. Units at the time of installation shall be free of any optical distortion.

2.1.12. CONTROLCAB TRASPARENT WINDOW SHADES

2.1.12.1. FAA Order 6480.18,3 April 1986, FAA Standard Specification for Transparent Plastic Window Shades for Use in Airport Control Tower (ATCT) Cabs, directs the use of Specification FAA-E-2470b, 4 December 1985, Transparent Plastic Window Shades for All New Control Tower and Cab Replacement Projects. Shades must also comply with FAA Order 6480.7c.

2.1.12.2. Shades shall be at least .125 mm thick. Color shall be smoke grey and body dyed. Shades shall be provided with rollers with constant tension to prevent shade contact with windows.

2.1.12.3. Shades shall follow the slope of windows and shall match size and shape of cab windows when in fully drawn position.

2.1.12.4 SHADES

2.1.12.4. Shades shall be “See-Thru Window Shades” as manufactured by Plastic View Inc., 4585 Runway Street, Suite B, Simi, CA 93063, Phone (800) 468-6301 or 805 520-9390 or an a roved equal.

2.1.13. CONTROL CAB CONSOLE. Provide and install a control cab con-sole as shown in attached 38 MSS/ EGD Dwg. No. SK SCCS-3 (Detail 1). The contractor shall provide and install the airfield lighting panel, power outage indicator lights, door ajar indicator light, dimmer switch for overhead lights and the master control for the intercom system in the cab console. Boxes for wind indicators should be constructed by the contractor, and laminated with the same finish as the console. Place single “strip bays” at the Local Control Flight Data and Ground Control positions, in addition to the dual “strip bay” provided for the Flight Data position. All other equipment will be provided and installed by the government. Console cut-outs for government installed equipment will be accomplished by government installers. Console colors, equipment location and surface configuration design will be coordinated with local ATCT staff.

2.1.14. EQUIPMENT ACCESS. Provide physical access to all mechanical and electrical rooms large enough to remove the largest piece of equipment from the room. Provide a means to lift equipment to all floors above ground level (hoist or elevator). Refer to ETL 88-4, Reliability and Maintainability (R&M) Design Checklist. Pay careful consideration to maintenance access when designing mechanical/electrical spaces.

2.1.15. EQUIPMENT ROOM DOORS. The doors to the equipment rooms must be a minimum of 2.18 m (7 ft 2 in) high and 91 cm (36 in) wide to allow for the movement of electronic equipment racks through them. Equipment room doors shall have closers and be lockable.

2.1.16. SUPPORT ITEMS. The project shall include connection to all required existing utilities such as water, sanitary sewer, electrical power, natural gas, communication ducts, etc. In seismic zones, all utilities shall be passed through the building envelope using flexible connectors and/or utility ducts which allow for differential building movement anticipated as a result of a seismic event. All-weather access roads and parking areas shall be provided as required.

2.1.16.1. MAJCOM criteria shall control access road and parking lot design. Lacking MMCOM criteria, minimum recommended criteria should include access road and parking lot with a chip seal surface. Parking spaces should accommodate the overhead staff, normal day shift crews and a few spaces for visitors. The width of the access road should be 6.1 m (20 ft) minimum.

2.1.16.2. Communication ducts and spares for future expansion will be installed only where the use of direct bury cabling is not feasible, e.g., under roads, taxiways, runways, buildings, parking and other paved areas such as sidewalks.

2.1.17. BUILDING OCCUPANTS. Refer to the Requirements and Management Plan (RAMP) for the number of building occupants and the hours of work.

2.1.18. INTERRUPTION OF CONTROL TOWER OPERATION. Contract documents should state that any required shutdown of the existing control tower during construction must be coordinated with the local contracting officer and base operations. The local user will be responsible for making necessary arrangements for control tower operations, i.e., obtaining/using an alternate facility, such as AN/TSW-7 or AN/MSN-7, in cases where the existing tower is not available for use due to construction.

2.1.19. SPECIALTIES. Building directory, bulletin boards and interior signs shall be in accordance with AFPAM 32-1097. The paragraphs below provide example guidance which can be used where no other suitable standard exists.

2.1.19.1. BUILDING DIRECTORY. Design should require the installation of a suitably sized building directory located near the main entrance. The directory case should be constructed of extruded aluminum with an architectural finish. It should have a changeable letter board with contractor-furnished insertable letters and a sliding glass front.

2.1.19.2 BULLETIN BOARDS. A bulletin board is required in the entrance. The bulletin board should be similar in construction to the building directory except with a cork backboard to use for tacking papers.

2.1.19.2 BULLETIN BOARDS

2.1.19.3. INTERIOR SIGNAGE. Signage shall be in accordance with AFPAM 32-1097 Air Force Sign Standards. Floor levels must be clearly marked at each landing level so that fire and emergency response personnel under smoke conditions can identify their location.

2.2 MECHANICAL

Mechanical design shall include heating, ventilation and air conditioning (HVAC), IAW ASHRAE (American Society of Heating, Refrigeration, and Air Conditioning Engineers) Handbook of Fundamentals and ASHRAE standards. Installation of a built-in vacuum cleaning system with receptacle in the control tower cab is recommended. Check also with the host command to determine if there are any additional requirements. A central HVAC system will normally be provided unless specific engineering analysis indicates that subcentral HVAC systems will be more economical on a life-cycle cost basis (LCC).

2.2.1. Design decisions for all projects shall be based on consideration of life-cycle cost. Studies shall be made lAW ETL 94-4, which balance initial construction cost with the operating and maintenance costs over the anticipated life of the facility, in order to provide facilities at the optimum life-cycle cost.

2.2.2. The design should ensure an adequate level of building environ-mental conditioning at the least life-cycle cost. The life-cycle cost analysis shall include all practical architectural and mechanical component alternatives and associated maintenance and operational cost. Alternative choices shall he made on the basis of least life-cycle cost rather than first cost. It is further expected that all mechanical equipment shall be installed with future maintenance needs, such as adequate accessibility, taken into account and that established commercial practices shall be followed.

2.2.3. ENERGY CONSERVATION MEASURES. Energy conservation must be a special-interest item in the design of a project. Ml aspects of the design should be IAW ETL 94-4. To make the facility design functional from an energy conservation standpoint, the designer must consider and include, where applicable, the following:

2.2.3.1. Heating equipment selected (boilers/hot water heaters/furnaces) shall have efficiencies meeting chapter II, subpart 8.3.1 or 10 CFR 435.

2.2.3.2. Use limited range thermostats available from established manufacturers. (Federal Property Management Regulation, 41 CFR Chapter 101, 1 Jul 94 available as an appendix to the DoD *Energy Managers Handbook on the Construction Criteria Base (CCB)* CD-ROM).

2.2.4. ENERGY MANAGEMENT AND CONTRO SSYSTEM (EMCS). All new/altered control towers will be

designed so they can be monitored by an EMCS system with control of the HVAC in the ATCT cab ‘AW ETL 86-2. Due to the mission essential staffing requirements and flight safety considerations, the tower cab occupants need direct control of the thermostat to regulate appropriate heating and cooling levels.

2.2.5. HVAC MEDIA. A Heating and air conditioning mediums will normally be hot and chilled water, respectively, (see Drawing 11). However, as stated above, other systems may be used if justified by a life-cycle cost analysis.

2.2.6. AIR DISTRIBUTION.

2.2.6.1 CONTROL CAB. The control cab shall receive heating and air conditioning by an air handling unit located in the mechanical room directly below the cab. Provide redundancy for the control cab air handling unit.

2.2.6.2. ALL OTHER FLOORS. Air handling units shall serve all other areas to include lobbies and bathrooms. Electronic equipment rooms shall be provided with redundancy so that if one unit goes down another unit will be capable of handling the entire load.

2.2.7. HEATING. Heating will normally be provided by a circulating hot water system. Water circulation shall be by means of two pumps, one operating and one standby.

2.2.8. CHILLERS. Two package chiller units shall be provided, each with a capacity equal to at least 60 percent of the total load or equal to the total load of the control cab plus the electronic equipment rooms, whichever is greater. The chilled water system shall be provided with an operating chilled water pump and a standby pump. The distribution system shall be valved to allow isolation of critical loads from the chilled water circuit. Interlock chillers so that in the event one fails or is down for maintenance, the second chiller will automatically begin operation.

2.2.8 CHILLERS

2.2.9. OUTSIDE DESIGN TEMPERATURES. Design air conditioning on the basis of 1.0 percent dry bulb temperature and 1.0 percent mean coincident wet bulb temperature summer occurrences or 0.4 percent annual occurrences as specified in AFMAN 32-7046, Engineering Weather Data. Design heating on the basis of a 99 percent dry bulb temperature.

2.2.10. INSIDE DESIGN CONDITIONS. Inside design conditions shall be IAW DoD Energy Managers Handbook, 1996, Appendix D-Heating: 68-70^{0}F and Cooling: 76-78^{0}f

2.2.11. HUMIDITY. All equipment in the tower is designed to operate in relative humidity range of 0 to 80 percent. Therefore, there are no special humidity requirements for equipment. Humidity levels should be IAW ASHRAE standards.

2.2.12. AIR CONDITIONING LOADS. Loads will be calculated using normal air conditioning load calculation procedures. Loads shall be based upon a personnel occupancy as indicated in the Requirements and Management Plan (RAMP). Loads due to electronic equipment should be verified during design. Minimum loads are as follows:

2.2.12.1. CONTROL CAB. 1120W (4,OOOBTU/H)

2.2.12.2. UPPER ELECTRONIC EQUIPMENT ROOM. 4400W (15,OOOBTU/H)

2.2.12.3. LOWER ELECTRONIC EQUIPMENT ROOM. 2930W (10,OOOBTU/H)

(Do not consider the above heat loads when calculating heating requirements.)

2.2.13. SYSYTEM CONTROL. Dual systems shall be sequentially controlled such that the loads are equally/ alternately shared by each system. In the event of a chiller failure, control shall be such that the non-critical loads (all areas other than control cab and electronic equipment rooms) can be dropped. The control system shall be designed stressing simplicity of operation. Care shall be taken to locate thermostats in an area not subject to direct sunlight or other heat source.

2.2.14. HEAT

2.2.14.1. SYSTEM TYPES. Use the most cost effective heat source for the installation, i.e., steam, high temperature hot water, gas, oil, etc. In addition, provide a backup source of heat at the facility in case of primary source loss.

2.2.14.2. WATER TREATMENT. Provide water treatment chemical feed and control equipment and pretreatment equipment IAW AFI 32-1054, for minimum life-cycle cost.

2.2.15. VENTILATION/AIR CONDITIONING SYSTEM. Outside air quantities IAW ASHRAE, current edition, shall be provided to all occupied spaces.

2.2.15.1. MECHANICAL YARD. Exterior equipment such as generators, fuel oil tanks, condensers and chilling equipment should be enclosed by an appropriate architectural screen to maintain the aesthetics of the facility and surrounding area.

2.2.15.1 ARCHITECTURAL SCREENING

2.2.15.1 ARCHITECTURAL SCREENING

2.2.15.2. WATER TREATMENT. Provide water treatment chemical feed and control equipment compatible with existing chemical treatments used on the base for the water quality encountered lAW AFI 32-1054. Use good quality automatic chemical proportioning and blowdown equipment, such as electric contact make-up water meters, conductivity blowdown controllers and adjustable solenoid blowdown valves. Closed systems shall be treated as necessary for water quality and conditions IAW AFI 32-1054. A tight non-leaking closed system is the best protection against corrosion.

2.2.16. FUEL OIL STORAGE TANKS. If fuel oil is used for heating, provide an above ground tank conforming to local, State and Federal environmental requirements, and NFPA 30. Heater and generator should also be able to run on JP-8 fuel. Above-ground self-diking tanks may be used, provided they are placed on a concrete pad, have spill and overfill protection, have interstitial monitoring, and the primary tank has a water drain and is epoxy-coated inside and outside Tanks without these features may be used, but must be contained with a dike.

2.2.16 TYPICAL FUEL OIL STORAGE TANK

2.2.17. METERING. Metering equipment is to be installed on all main energy and water supplies to the building, as required by ETL 94-2. The meters are to determine consumption, not rate of consumption. Demand or maximum flow meters are not required.

2.3 PLUMBING

Plumbing design shall be IAW AFJMAN 32-1070, Chapter 4, and the Uniform Plumbing Code.

2.3.1. BUILDING WATER SUPPLY

2.3.1.1. SOURCE OF SUPPLY. Water source for this facility shall be from the base water supply system. Note: Remote locations may require a separate well as a practical alternative to costly utility connections to the base water supply system.

2.3.1.2. HOT WATER. Domestic hot water shall be provided for restroom areas. Consider an instantaneous hot water heating faucet or a small hot water heater in the restroom.

2.3.1..3. WATER PRESSURE. The tower will likely need a water pressure booster system to get water to the cab.

2.3.1.4. SINK. Provide a sink with hot and cold running water in the control tower cab. The area below the sink should contain storage.

2.3.1.4 TYPICAL SINK

2.3.1.5. HOSE BIBCOCK. Provide an external non-freeze hose bibcock on the catwalk and at ground level. Each hose bibcock will have a backflow preventor.

2.3.1.6. BACKFLOW PREVENTION. The supply connection to each fixture or appliance that is subject to back-siphonage of non-potable liquids, solids or gases will be protected in accordance with the *International Plumbing Code.*

2.3. 2. PIPING SYSTEM.

2.3.2.1. MATERIALS. The exterior underground service piping to the facility shall be PVC or type L copper. Do not use galvanized steel piping for the underground water service because of corrosion problems. For interior piping, consider PVC or CPVC and polyethylene to reduce project cost.

2.3.2.2. FEATURES. Domestic water lines should have water hammer arresters. Self-closing fixture valves should be used at all fixtures with combination hot/ cold water faucets on all sinks and lavatories.

2.3.2.3. RESTROOMS. Provide a minimum of one unisex restroom. Primary restroom location shall be adjacent to the mechanical room directly below the control cab. Recommend providing one shower and locker area in towers with more than one restroom where program requirements reflect a 24-hour work shift. Restroom fixtures and interior finishes shall be in accordance with MAJCOM design standards. Lacking MAJCOM or other standards, use the following guidance. Restroom doors shall be provided with a bathroom door lockset. Restrooms shall have one tank type water closet and one lavatory with mirror. Plumbing fixtures should be wall hung to facilitate cleaning and maintenance. Fully or partially recessed (depending on wall depth) towel dispensers with integral waste receptacles should be used. Dispenser/receptacle should have standard stainless steel architectural finish with a removable stainless steel waste container in the bottom receptacle portion. No sanitary napkin dispenser is to be installed in unisex restrooms. A sign depicting “In Use” should be included and installed to aid in occupancy notification.

2.4
ELECTRICAL

2.4.1. Use AFJMAN 32-1080 and AFJMAN 32-10128, as guidance for design of control towers. Non-technical, critical-technical and technical power must have separate panels.

2.4.2. Non-technical, critical-technical and technical power requirements must be determined by the total loads as calculated by the designer.

2.4.3. OPERATIONAL (CRITICAL-TECHNICAL AND TECHNICAL) POWER REQUIREMENTS.

2.4.3.1. CONTROL CAB (CONUS). Government furnished electronic equipment to be installed by other than the construction contractor in the control cab will require a minimum of 6 each, single pole, 120 VAC, 20 amp circuit breakers from a 120/208 VAC, 60 Hz, three phase source designed to comply with ANSI C84.1. Terminate the six circuits in straight blade duplex receptacles, Harvey Hubbell P/N 5462 or equivalent, one receptacle located in/on the wall under each of the six wrap-around console positions. The branch circuit rating shall not be less than the non-continuous load plus 125 percent of the continuous load. Provide spare 1 pole, 20 AMP, 120 VAC circuit breakers in panel serving the control tower cab.

2.4.3.2. UPPER ELECTRONIC EQUIPMENT ROOM (CONUS). Electronic equipment to be installed in the upper electronic equipment room will require a minimum of 10 each, single pole, 120 VAC, 20 amp and 2 each 30 amp, single pole, 120 VAC circuit breakers from a 120/208 VAC, 60 Hz, three phase source designed to comply with ANSI C84.1. Total connected load will not exceed 55 amps. (Note: Provide “unistrut” at 1.2 m (4 ft) maximum on center, on underside of floor above to hang cable racks/trays. These racks/ trays will be government furnished and government installed (GFGI). The “unistrut” is 12 gage, Versabar Corp P/N VA-i or equivalent, and is to be hung with the open side down.)

2.4.3.3. LOWER ELECTRONIC EQUIPMENT ROOM (CONUS). Electronic equipment to be installed in the lower electronic equipment room will require a minimum of 10 each, single pole, 120 VAC, 20 amp and 2 each, single pole, 120 VAC, 30 amp circuit breakers from a 120/208 VAC, 60 Hz, three phase source designed to comply with ANSI 84.1. Total connected load will not exceed 50 amps (Provide “unistrut” as noted in the preceding paragraph)

2.4.3.2 TYPICAL UPPER
ELECTRONIC EQUIPMENT ROOM

2.4.3.3 TYPICAL LOWER
ELECTRONIC EQUIPMENT ROOM

2.4.3.4. Overseas locations shall use local power standards (Many European locations have 230/400 volts 50Hz at the transformer secondaries and are designed to provide nominal 220/380 volts 50Hz at the loads to allow some voltage drop. Note the UK has 240 volts line to neutral and Italy has 127 volts line to neutral, both at 50Hz.) Wall power receptacles should meet location standard voltage requirements (European power standards) to accommodate procurement of local electric items (fans, coffee pots, etc.).

2.4.4. Power sources shall consist of a primary source with a back-up (Class C) diesel generator IAW AFI 32-1062 and AFI 32-1063. Heater and generator should also be able to run on JP-8 fuel.

2.4.4.1. Back-up generator shall be Class C equipped with auto-stat and auto-transfer capability. The generator shall be designed to come on line with-in 10 seconds after the primary source is lost. The generator run control system shall include a 0-2 hour adjustable timer. The timer shall operate on primary power and shall reset to the preset delay of 0-2 hours upon each power failure. A manual/automatic switch shall be provided to permit manual or automatic operation. The power system shall be equipped with a remote status power outage warning box. The power outage warning box shall be equipped with green, yellow and red lights, low db annunciator horn and silencer switch. The red light shall flash and the horn shall activate upon loss of primary power source. The yellow light shall remain on when running on standby power. The green light shall remain on when primary power is in use and/or available for use. Warning lights shall be located in the control cab console.

2.4.4.1 TYPICAL BACK-UP GENERATOR

2.4.4.2. GENERATOR FUEL SUPPLY. Fuel storage shall be sized as specified in ETL 90-5. Design fuel storage and supply for emergency generators to ensure continuous operation during seismic events. This, for example, requires piping and flexible connections at the tank, building envelope, and generators that remain fuel tight throughout the seismic event and after. Consider the following when locating the tank: protection against damage (intentional or unintentional), protection against fuel spills, and containment of spills.

2.4.4.3. GENERATOR CAPACITY. The generator shall be sized to meet critical technical power loads in addition to technical power loads, described above. These critical technical power loads shall include power for control cab lighting and HVAC systems serving the control cab, electronic equipment rooms and the elevator.

2.4.4.4. POWER SURGE SUPPRESSOR. Elevator motor should have a soft start system. The elevator power bus shall be isolated from technical power and critical technical loads to protect such loads from transient voltage variations. Surge protection shall reduce lightning and switching surges to within acceptable quality power limits.

2.4.4.5. The contractor shall provide and install the airfield lighting control panel in the control cab console as shown on the console drawings. The contractor should make the physical connection (including underground ducting) from the airfield lighting vault to the airfield lighting control panel at the ATCT. Provide one 10 cm (4 in) empty square duct between power panel and floor trench in control cab. The airfield lighting control panel shall conform to minimum requirements of FAA specification L 821, *Panels for Remote Control of Airport Lighting.* Updated, improved controls are encouraged but must be approved by the MAJCOM.

2.4.6. COMMUNICATION DUCTING AND CABLING SYSTEMS. Administrative telephone wiring/cabling must be installed under the Military Construction (MILCON) project and funded with MILCON appropriations. However, specialized communication wiring/cabling (e.g., cabling which extends from the air traffic control tower to the Radar Approach Control (RAPCON), Navigational Mds (NAVAIDs), remote transmitters and receivers, etc.) will be installed by in-house E&I personnel. Raceways, conduits, pullboxes, duct banks, etc., necessary for the installation of these specialized communication cables shall be included in the contract and are as follows:

2.4.6.1. Provide ducts and trenches within the tower as shown in Drawings 4 thru 7. Two 100 mm (4 in) ducts shall be provided for antenna cables between the equipment room and the roof. Ducts shall be installed adjacent to each of two roof support columns and terminate in the weather heads on the roof. The two 100 mm (4 in) ducts for antenna cabling should not be a continuous run from the equipment room to the roof. The two conduits should run from the radio equipment room to the floor just below the cab. There should then be a cable ladder, trough or duct over to another set of 100 mm (4 in) conduits that continue the run up to the weather heads on the roof. Provide four 150 mm (6 in) ducts from the equipment room to the floor trench in the cab. Ducts shall be provided with pull boxes on each floor that they pass through, sized per the *National Electric Code.*

2.4.6.2. Where cables are required to be buried beneath paved areas, provide cable ducts to support future installation of specialized communication wiring/ cabling. Generally, a bank containing six 100 mm (4 in) ducts is adequate for this purpose. Duct banks should be used for critical communications wiring; direct bury for other cabling will be at the discretion of the MAJCOM. Duct banks may be installed but are not required where the use of direct bury cabling is feasible.

2.4.6.3. Provide manholes and conduit stub-outs as necessary to accommodate future communications cable installation by others. Provide a 0.56 m^2 (6 sq ft) minimum communications space under the first floor, immediately beneath the communications duct riser. The manhole shall have a manhole access port from the first floor. Run six 100 mm (4 in) ducts from manhole below floor to a point at least 1.5 m (5 ft) beyond the building line. Direction of duct lines will be provided at the pre-design conference.

2.4.6.4. Provide three 100 mm (4 in) conduits from the cable trays in the equipment rooms into the vertical communications chase.

2.4.6.5. Site specific requirements for communication ducts, conduits, manholes, and stub-outs will be shown in the RAMP or provided to the designer at the pre-design conference.

2.4.7. CABLE SEPARATION. Power and communication cables shall be physically separated by distance or by barrier to preclude power cables from coming into contact with communication cables in accordance with the National Electric Code. Cable ladders shall be provided. Vertical shafts shall be provided with fire separation assemblies in accordance with Paragraph 2.6.2.2.

2.4.7 CABLE SEPARATION

2.4.8. emergency lighting. Ensure the stairway lighting and at least one light in each continuously occupied room is supplied by circuits powered by the emergency generator. Battery powered emergency lights are not to be provided.

2.4.9. TELEPHONE CABINETS. Provide a minimum 1070 mm wide by 1240 mm high by 150 mm deep (42 in by 49 in by 6 in) telephone cabinet in the upper electronic equipment room. Cabinet shall be interconnected by a 150 mm (6 in) square duct to the vertical communication riser. Cabinet shall be provided with “lift out” door.

2.4.10. LIGHTNING PROTECTION. Lightning protection shall be provided IAW requirements of AFM 88-9 Chapter 3 (to be replaced by AFJMAN 32-IOXXX), ETL 90-6, and AFI 32-1065.

2.4.11. EXTERIOR LIGHTING. Building enrances should be lighted to 21.5 lx (2 foot-candles) by High Pressure Sodium (HPS) units.

2.4.12. OBSTRUCTION LIGHTS. Provide obstruction lights IAW requirements of AFI 32-1044, *Visual Air Navigation Systems.*

2.4.13. PARKING LOT LIGHTING. Lighting should be provided per MAJCOM standards. Where no guidance is given: a lighting level of 5.4 lx (0.5 foot-candles) at ground level is required in the parking lots. The lighting should use HPS lamps for low energy consumption. Lighting should be mounted on aluminum/steel standards (anodized aluminum in coastal environments) which are mounted on concrete piers.

2.4.14. LIGHTING

2.4.14.1. CONTROL CAB AREA LIGHTS. Area lights sha11 be recessed flood lights with non-reflective grooved baffles. Lighting should be compatible with night vision goggle requirements.

2.4.14.2. CONTOL CAB SPOTLIGHTS. Spotlights shall be recessed pinhole lights, dimmer controlled, with approximately 64 mm (2.5 in) opening, 100 watt bulb.

2.4.15. GROUNDING. Tower shall have a multi-point (earth electrode sub- system) facility grounding system IAW AFI 32-1065. A Signal Reference subsystem wire (minimum 2/0 copper, yellow insulated) shall be installed in the vertical communication riser referenced in paragraph2.4.6.1 above. Do not ground to the structure. The Signal Reference subsystem wire shall connect directly to the multi-point facility grounding electrode system.

2.4.16. EQUIPMENT REFERENCE GRID. The control tower cab and the electronic equipment rooms shall be provided with an equipment reference grid as described in IEEE Standard 1100-1992 *(IEEE Recommended Practice for Powering and Grounding Sensitive Electronic Equipment).* (Equipotential Grounding System, 1842 EEG Sketch LBWSOOOO8GSOO.)

2.4.17. LIGHT GUN OUTLETS. Light gun outlets shall be provided in locations as shown in Drawing 8. Eye bolts for hanging the light guns shall be installed by contractor.

2.4.18. TELEPHONE OUTLETS. Telephone outlets are required in the offices of the facility. Conduit for telephones can be stubbed, with bushings provided, above the ceiling where suspended ceilings are used. A cable tray should run from the Telephone Terminal Backboard (TTB) to and along the centerline of the facility when this method of installation is used. Conduit is only necessary for areas where there is no ceiling or there is no access above the ceiling. When conduit is used, it should be prewired. Telephone service to the building will be provided by implementation of a communications scheme.

2.4.19. DERVICE OUTAGE DURATION LIMITATIONS. Power outages for contractor connection will be arranged by coordination through the authorized representative of the contracting officer with the base utilities personnel. All outages must be requested by the contractor in advance so that tower operations will not be inadvertently interrupted. Special provisions of the contract must clearly delineate these requirements.

2.5 ELEVATOR

2.5.1. Towers with a cab floor level of 50 ft or more above the ground level shall be equipped with an elevator. New elevators shall conform to the requirements of ASME Al 7.1 and ANSI Safety Codefor Elevators and Escalators, including ventilation of shaft. Elevator speed shall be a minimum of 0.76 m/s (150 ft/min).

2.5.2. Existing elevators shall conform to ASME/ANSI A17.3, except Phase II emergency in-car operation is not required. Net load will not be less than 540 kg (1,200 lbs).

2.5.3. As a general practice, electric elevators with a soft start system should be specified. However, consideration may be given to the use of a hydraulic elevator when ATCT is less than 18 m (60 ft) in height.

2.5.4 OPERATION. The elevator shall operate from ground floor to training/ simulator room (or upper equipment room) whichever is higher, stopping at each intermediate floor. Elevators shall be interconnected with the fire alarm/ detection telephone and emergency power systems to recall the elevator to the ground floor and hold it there until the alarm is reset and/or the facility is returned to commercial power with the following exception: A three-position (on, off, and bypass) key-operated switch shall be installed in the first floor lobby to allow the elevator to operate on emergency power. When the switch is in the "on" position, normal elevator service shall be provided. When the switch is in the "bypass" position, the elevator shall operate independently of the fire alarm/detection system and the commercial power source. The key shall be removable only from the "on" or "off" positions.

2.5.5. DOORS. All elevator doors are to be the sliding type and shall provide at least a 0.9 m wide by 2.2 m high (3 ft wide by 7 ft 2 in high) clear opening. Elevator doors will not open to the stair enclosure.

2.5.6. ELEVATOR ELECTRONIC EQUIPMENT. Provide a containment vessel in the absence of an industrial waste line. Location of elevator supporting electronic equipment in a conditioned space is required by some types of elevator systems.

2.5.5 ELEVATOR

2.5.7. ELEVATOR PIT. Elevator pit shall have pit light, GFE electrical outlet, pit ladder extending 1017 mm (42 in) above the sill line and 113 mm (41/2 in) from the wall and a sump pump connected to industrial waste line. Provide a containment vessel in the absence of an industrial waste line. Smoke detectors shall be installed in the elevator machine room and hallway in front of the elevator doors.

2.6 FIRE PROTECTION AND LIFE SAFETY REQUIREMENTS

This section provides the designer with fire protection and life safety information necessary to plan and design ATCTs and complies with applicable sections of AF directives, MIL HDBK I 008B, *National Fire Codes,* the National Fire Protection Association's *Life Safety Code, NFPA 101,* and the *Uniform Building Code* (UBC). These standards are applicable in CONUS and overseas. Host nation laws in overseas locations should also be considered. The Status of Forces Agreement for the host nation should be consulted to guarantee that no conflicts occur.

2.6.1. OCCUPANCY. Since ATCT facilities have well defined work areas, work stations and operational positions, occupancy loads are determined by actual count of people planned to occupy the facility. Included in the count should be current and future controllers, staff personnel, maintenance technicians and supervisors plus an allowance for visitors. The total occupancy of an ATCT is normally less than 25 people. Occupancy of the cab is generally 10 persons or less. The rest are office workers and technicians working in other areas of the tower. The type of occupancy is business/special structures.

2.6.2. CONSTRUCTION. All towers must be Type I or Type II (fire resistive) construction according to the *Uniform Building Code* (UBC).

2.6.2. 1. Fire rated partitions shall be installed to separate areas of hazardous occupancies such as mechanical, generator, storage, electrical and technical equipment rooms from areas of ordinary occupancy such as the stairway, offices, training rooms and control cab. Fire partitions shall be constructed to have a fire resistance rating of one hour with the exception of the mechanical and generator rooms greater than 9.3 m^2 (100 sf) which shall have a fire resistance rating of two hours and fire rated doors of one and one-half hours. Doors from areas of hazardous occupancies shall not open directly into the stairway, which is designed as a smoke proof enclosure.

2.6.2.2. All ducts and chases must be fire/smoke stopped by an approved/ listed method at every floor. Construction contractor shall install firestops in the vertical cable ducts (IAW NFPA standards) after installation of cables by government personnel. Stopping methods used must permit repeated removal and replacement, without special tools, to support changing requirements.

2.6.2.3. Flame spread and smoke development ratings shall be IAW MW HDBK1008B. Class B interior finish may be substituted for Class A interior finish in areas of ordinary occupancy such as the offices, training rooms and control cabs of towers that are completely protected with automatic sprinklers. All stairway finish material shall be Class A and floor finish shall be Class I rated.

2.6.3. FIRE SPRINKLER SYSTEM. Towers shall be provided with complete automatic sprinkler protection IAW MIL HDBK 1008B. Wet-type systems shall be provided in all areas unless subject to freezing. Protection for electronic rooms shall be provided IAW ETL 93-5. Towers more than 15.2 m (50 ft) to the cab floor (minimum tower height per Drawing 1 is 5-stories or 16 m (53 ft)) must be provided with a wet standpipe and an exterior fire department connection if the base water system has sufficient pressure to supply the standpipe. If the water system has insufficient pressure or is subject to freezing, then a dry standpipe may be installed. Pressure and flow tests shall be conducted on the water mains near the project site showing static pressure and flow capacity. A copy of a recent Fire Department flow test should be attached to the RAMP. Machine room shall be provided with securable shut off valve installed outside elevator machine room.

2.6.4. DOORS

2.6.4.1. ELEVATOR VESTIBULE OR STAIRWAY LANDING. Doors that connect with the stairwell must be equipped with automatic door closers. These doors shall swing in the direction of egress travel when serving any hazardous area or serving an occupant load of 10 people or more. Doors shall have the capability of opening at least 90 degrees and have a clear width at the exit way of at least 910 mm (36 in).

2.6.4.2. All doors shall have a master keying system including coded entry doors. Key control should be compatible with the key control of the rest of the installation.

2.6.5.1. ATCTs must have the stairway designed as a smoke proof enclosure. The purpose of the smoke proof enclosure is to prevent heat and smoke from entering the stairwell. The smoke proof enclosure shall consist of the vestibule and stairwell continuously enclosed from the ground floor to the bottom of the cab floor with a two hour fire rated wall.

2.6.5.1 STAIR ACCESS TO CAB

2.6.5.2. The width of a new stairway shall be 1120 mm ~ in). There shall be not more than 3.7 m (12 ft) vertically between landings. The handrail may extend from each side of the stairway a distance of 88 mm (31/2 in) into the required width. The stair rise shall not exceed 175 mm (7 in), and the tread shall be at least 275 mm (11 in), and the total height of two risers plus the width of one tread shall not be less than 610 mm (24 in), except as follows:

2.6.5.3. For a control tower that is to receive existing cab replacement only, the existing stairway will remain in use if it meets the requirements of NFPA101, paragraph 5.2.2.1.

2.6.5.4. Non-complying stairs may continue to be used, subject to the approval of the user and the authority having jurisdiction (the Base Civil Engineer (BCE), acting in his or her capacity as the Base Fire Marshall).

2.6.5.5 Circular stairways are prohibited except in existing cabs where the circular stairway serves an occupant load of 10 persons or less and the minimum width of run is not less than 125 mm (5 in) and the rise is not more than 225mm (9in).

2.6.6. NUMBER OF EXITS. Towers shall be provided with a single exit (See NFPA 101, paragraph 30-2.4.). Consider specifying a backup egress to provide a secondary means of escape from the cab, except when stairway and doors meet fire rated enclosure requirements and a secondary egress system is not required.

2.6.7. MINIMUM FIRE DETECTION REQUIREMENTS. IAWMILHDBK1OO8B *Fire Protection for Facilities - Engineering, Design and Construction,* the minimum fire detection to be provided in the ATCT shall be an automatic fire detection and alarm system (including interconnection to the base fire alarm receiving system) and hand-held fire extinguishers. The fire suppression agent for hand-held extinguishers shall be suitable for Class A, B and C fires. Halon extinguishers shall not be used.

2.6.8. FIRE DETECTION AND ALARM SYSTEMS

2.6.8.1. Automatic smoke detection and alarm systems shall be installed in all ATCT facilities. Smoke detectors shall be located near all probable sources of fire or smoke including mechanical equipment rooms, return air plenums, electrical/electronic rooms, facility operational areas, etc. Ionization type detectors are preferred. The system must transmit both alarm and trouble signals to the fire department. Transmitter equipment must be compatible with receiving equipment at the fire department's alarm communications center.

2.6.8.2. Method of transmission is by a radio transceiver compatible with radio receiving equipment in the main fire station. Facility equipment generally includes automatic spot type detectors (rate of rise and fixed temperature type), manual pull stations, bells, standby power supply, zoned control and transmission equipment.

2.6.9. CAB REPLACEMENT PROGRAM. The cab replacement program is designed to take a structurally sound tower shaft and place a new operational cab on top and replace certain supporting equipment (mostly communication). The result of this action is essentially to provide the tower with an operational life of a new tower. As a minimum, the following work should be done to the existing tower shaft:

2.6.9.1. All ducts and chases are to be fire-stopped. Stopping should provide for easy removal and replacement by cable maintenance personnel.

2.6.9.2. Flame spread and smoke development ratings shall be IAW MIL HDBK 1008B.

2.6.9.3. All other interior finish materials must be either Class A or B, and floor finishes must be either Class I or Class II rated.

2.6.9.4. Fire protection for stairwells should meet the requirements of the design guide if practical but never less than:

2.6.9.4.1. Stairwells in towers four (4) stories or more to the cab floor must have a separation assembly having at least a two hour fire resistive rating.

2.6.9.4.2. Stairwells in towers three (3) stories or less to the cab floor must have a separation assembly of one hour fire resistive rating.

2.6.9.4.3. Existing stairwells will remain in use provided that they meet the requirements of the NFPA 101, paragraph 5.2.2.1.

2.6.9.5. Elevators added as part of the cab replacement shall not open into the stair enclosure. Existing elevators which open into the stairs shall be provided with a smoke enclosure equivalent to the stairs, i.e., room walls adjacent to the elevator shaft shall be rated IAW ASME/ANSI A17.1, *Safety Code for Elevators and Escalators.*

2.6.9.6. Floor levels must be clearly marked at each landing level so that fire and rescue personnel under smoke conditions can identify where they are.

2.6.9.7. Towers shall be provided with complete automatic sprinkler protection IAW MIL HDBK 1008B. Wet-type systems shall be provided in all areas unless subject to freezing. Dry pipe system with exterior stand pipe is allowable where direct connection to the base water supply is not available.

2.6.9.8. All doors shall be on a master key system including coded entry doors.

2.6.9.9. All doors that connect with the stairs must be equipped with an automatic closer.

2.6.9.10. A complete fire detection and alarm system, including interconnection to the base alarm receiving system, shall be provided.

2.6.10. PROTECTION FOR PERSONS WITH DISABILITIES. Persons who are unable to use the stairway for emergency egress and who are permitted access to the tower shall be restricted to the level of exit discharge only. The ATCT is intended to be manned by able-bodied personnel. Air Force policy requires all air traffic controllers to pass and maintain a current flight physical examination. Provisions for the physically handicapped are not applicable.

2.6.11. FIRE HYDRANTS. Fire hydrants shall be provided IAW MW HDBK 1008B. Fire hydrants will be required as part of this facility. If added, fire hydrants are to conform to American Water Works Association (AWWA) Standard C502. Hydrants shall have a 150 mm (6 in) bell connection, two 64 mm (2-1/2 in) hose connections and one 113 mm (4-1/2 in) pumper connection. Outlets shall have American National Standard fire hose coupling threads, working parts to be bronze. Hydrants shall be dry barrel type conforming to AWWA C502 with valve opening at least 125 mm (5 in) in diameter. At each fire hydrant installation, an isolation valve shall be installed between the hydrant and the main. The isolation valves must be contained in a valve box.

2.6.12. FIRE EXTINGUISHER CABINETS. Fire extinguisher cabinets shall be semi-recessed or surface mounted, 213 mm deep by 300 mm wide by 675 mm high (8-1/2 in by 12 in by 27 in), shall be provided. Fire extinguishers will be government furnished, government installed.

2.7 SECURITY

2.7.1. TELEPHONES. Provide and install an intercom station at the main entrance to the tower and at the entrance to the control cab. The intercom station located on the exterior of the tower must be installed in a weatherproof box.

2.7.2. DOOR LOCKS. Provide and install cipher locks and door closers on the two doors mentioned above. Also provide a light in the control cab console which indicates when either of these doors is not closed. The lock on the main entry and cab doors shall have a remote control override switch, controllable from the tower cab.

2.7.3. Recommend a covered or recessed entrance or inner vestibule with outer and inner doors as possible options to allow for security requirements and provide protection from the elements. On the main entry door and entry door to the control cab provide a one-way reinforced window and a slot in the doors for the passage of ID cards.

2.8 INTERCOM SYSTEM

2.8 INTERCOM SYSTEM An intercom system shall be provided and installed to allow audible communication between all floors and stations specified above. Master control shall be located in the control cab. This item is bought and installed by the contractor in the prewiring contract.

APPENDIX 1 - REFERENCES

10 CFR 435, CH II , SUBPART 8.3.1 HEATING EQUIPMENT EFFICIENCIES

CFR CH 101 FEDERAL PROPERTY MANAGEMENT REGULATION. AVAILABLE AS AN APPENDIX TO THE DOD ENERGY MANAGERS' HANDBOOK

1842 EEG/EEISG (AFCC) SKETCH LDBWS00008GS000 EQUIPOTENTIAL GROUND PLANE FOR SIGNAL REFERENCE SUBSYSTEM (ATCH 3, TWO PAGES). LATEST INFORMATION WILL BE SENT UPON REQUEST.

1842 EEG/EEISG (AFCC) SKETCH SK 86-1 TOWER RADAR DISPLAY INSTALLATION DETAILS (ATCH 2, ONE PAGE). LATEST INFORMATION WILL BE SENT UPON REQUEST.

TRAFFIC CONTROL TOWER WRAP AROUND CONSOLE (ATCH I, FIVE PAGES). LATEST INFORMATION WILL BE SENT UPON REQUEST.

AFH 32-1084 FACILITIES REQUIREMENTS HANDBOOK

AFI 32-1026 PLANNING AND DESIGN OF AIRFIELDS

AFI 32-1044 VISUAL AIR NAVIGATION SYSTEMS

AFI 32-1044 CORROSION CONTROL

AFI 32-1062 ELECTRIC POWER PLANTS AND GENERATORS

AFI 32-1063 ELECTRIC POWER SYSTEMS

AFI 32-1065 GROUNDING SYSTEMS

AFJMAN 32-1070 CH 4 PLUMBING

AFJMAN 32-1080 ELECTRICAL POWER SUPPLY AND DISTRIBUTION

AFJMAN 32-10128 ELECTRIC DESIGN, INTERIOR ELECTRICAL SYSTEMS

AFJMAN 32-1050 SEISMIC DESIGN FOR BUILDINGS AND AFJMAN 32-101131 DESIGN CRITERIA FOR FACILITIES IN AREAS SUBJECT TO TYPHOONS AND HURRICANES

AFPAM 32-1097 AF SIGN STANDARDS

ANSI C84.1 AMERICAN NATIONAL STANDARDS INSTITUTION (ANSI) C84. I, 19821 FOR ELECTRIC POWER SYSTEMS AND VOLTAGE RATINGS (60 HZ)

ANSI/NEMA STANDARDS ON ELECTRICAL POWER SYSTEMS, LATEST ISSUE

MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES

ASHRAE 62-89

ASME/ANSI A17.1 & A17.3 SAFETY CODE FOR ELEVATORS AND ESCALATORS

ASTM C 1036-85 STANDARD SPECIFICATIONS FOR FLAT GLASS

AWWA C502 AMERICAN WATER WORKS ASSSOCIATION

MIL HDBK 1002 STRUCTURAL ENGINEERING - GENERAL REQUIREMENTS

MIL HDBK 1008B FIRE PROTECTION FOR FACILITIES ENGINEERING, DESIGN AND CONSTRUCTION

MIL HDBK 1190 FACILITY PLANNING AND DESIGN GUIDE

MIL STD 188-124B GROUNDING, BONDING AND SHIELDING

MIL STD 1472D HUMAN ENGINEERING DESIGN CRITERIA FOR MILITARY SYSTEMS EQUIPMENT AND FACILITIES, LATEST UPDATE

ETL 86-2 ENERGY MANAGEMENT AND CONTROL SYSTEMS (EMCS), LATEST UPDATE

ETL 88-4 RELIABILITY AND MAINTAINABILITY (R&M) DESIGN CHECKLIST

ETL 90-5 FUEL AND LUBE OIL BULK STORAGE CAPACITY FOR EMERGENCY GENERATORS, LATEST UPDATE

ETL 90-6 ELECTRICAL SYSTEM GROUNDING STATIC GROUNDING AND LIGHTNING PROTECTION LATEST UPDATE

ETL 93-5 FIRE PROTECTION CRITERIA - ELECTRONIC EQUIPMENT INSTALLATIONS

ETL 94-2 UTILITY METERS IN NEW AND RENOVATED FACILITIES, LATEST UPDATE

ETL 94-4 ENERGY USE CRITERIA FOR FACILITIES IN THE MILITARY CONSTRUCTION PROGRAM, LATEST UPDATE

ETL 94-5 FIRE PROTECTION ENGINEERING CRITERIA AND TECHNICAL GUIDANCE - EMERGENCY LIGHTING AND MARKING OF EXITS, LATEST UPDATE

FAA ADVISORY CIRCULAR NO. 150/5345-3D SPECIFICATION FOR L 821 PANELS FOR REMOTE CONTROL OF AIRPORT LIGHTING, 8 AUG 86

FAA ORDER 6480.7C FAA STANDARD SPECIFICATION FOR TRANSPARENT PLASTIC WINDOW SHADES FOR USE IN AIRPORT CONTROL TOWER (ATCT) CABS

FAA ORDER 6480.18 FAA STANDARD SPECIFICATION FOR TRANSPARENT PLASTIC WINDOW SHADES FOR USE IN AIRPORT CONTROL TOWER (ATCT) CABS

FAA-E-2470B TRANSPARENT PLASTIC WINDOW SHADES SPECIFICATION, LATEST UPDATE

FIPS PUB 94 FEDERAL INFORMATION PROCESSING STANDARDS (FIPS) PUBLICATION 94, GUIDELINE ON ELECTRICAL POWER FOR ADP INSTALLATIONS

NEPA NATIONAL ENVIRONMENTAL POLICY ACT

NEPA 70 NATIONAL ELECTRIC CODE (NEC), LATEST ISSUE

NFPA 101 NATIONAL FIRE PROTECTION ASSOCIATION LIFE SAFETY CODE

NFPA 13 SPRINKLER SYSTEMS

NFPA 30 FLAMMABLE AND COMBUSTIBLE LIQUIDS CODE

NFPA 72 NATIONAL FIRE ALARM CODE

TM 5-815-3 DESIGN OF CONTROL SYSTEMS FOR HVAC

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